

Sensitivity analysis of recovery efficiency in high-temperature aquifer thermal energy storage with single well - DTU Orbit (08/11/2017)

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High-temperature aquifer thermal energy storage system usually shows higher performance than other borehole thermal energy storage systems. Although there is a limitation in the widespread use of the HT-ATES system because of several technical problems such as clogging, corrosion, etc., it is getting more attention as these issues are gradually alleviated. In this study, a sensitivity analysis of recovery efficiency in two cases of HT-ATES system with a single well is conducted to select key parameters. For a fractional factorial design used to choose input parameters with uniformity, the optimal Latin hypercube sampling with an enhanced stochastic evolutionary algorithm is considered. Then, the recovery efficiency is obtained using a computer model developed by COMSOL Multiphysics. With input and output variables, the surrogate modeling technique, namely the Gaussian-Kriging method with Smoothly Clipped Absolute Deviation Penalty, is utilized. Finally, the sensitivity analysis is performed based on the variation decomposition. According to the result of sensitivity analysis, the most important input variables are selected and confirmed to consider the interaction effects for each case and it is confirmed that key parameters vary with the experiment domain of hydraulic and thermal properties as well as the number of input variables.

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